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HW 3.1 Graphing Sine and Cosine Function with Phase Shift, Vertical Expansion and Compression

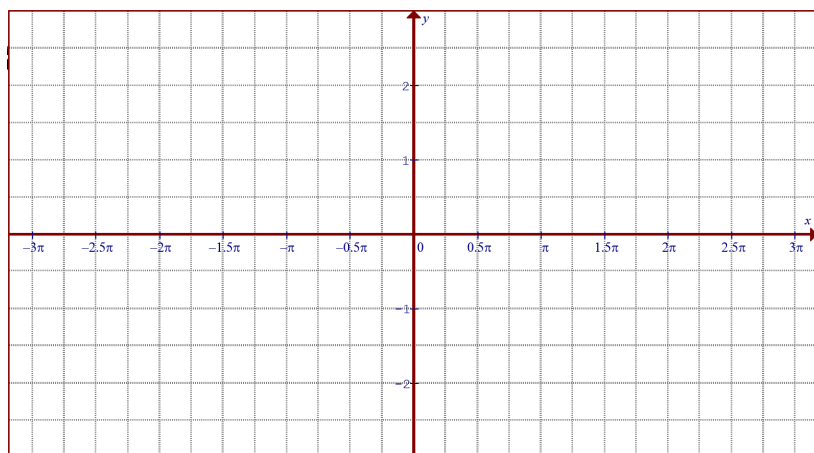
1. Indicate the transformations for each of the following equations:

a) $y = \sin \theta \rightarrow y = 2 \sin \left(\theta + \frac{\pi}{3} \right) - 2$	b) $y = \sin \theta \rightarrow y = -3 \sin \left(\theta - \frac{\pi}{5} \right) + 4$
c) $y = \sin \theta \rightarrow y = -\sin(-\theta)$	d) $y = \cos \theta \rightarrow y = -\cos(-\theta)$
e) $y = \sin \theta \rightarrow y = \frac{3 \cos(\theta)}{2}$	f) $y = \cos \theta \rightarrow y = 6 - \sqrt{2} \cos \left(\frac{2\pi}{3} - \theta \right)$

2. Indicate the amplitude, phase shift, domain and range for each function:

a) $y = 4 \sin \theta - 2$	b) $y = -\frac{3}{2} \cos \left(\theta + \frac{5\pi}{6} \right)$
c) $y = 3 \cos \left(x - \frac{\pi}{3} \right) + 4$	d) $y = 5 \cos \left(x - \frac{7\pi}{6} \right) + 4$

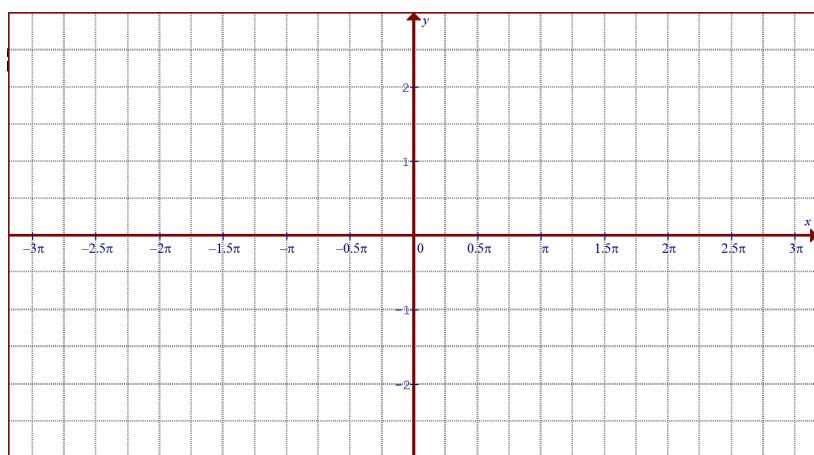
3. Graph the function on the graph provided: $y = 2 \sin\left(\theta - \frac{\pi}{2}\right) - 0.5$



Indicate the domain and range:

Find a general formula for all the x-intercepts

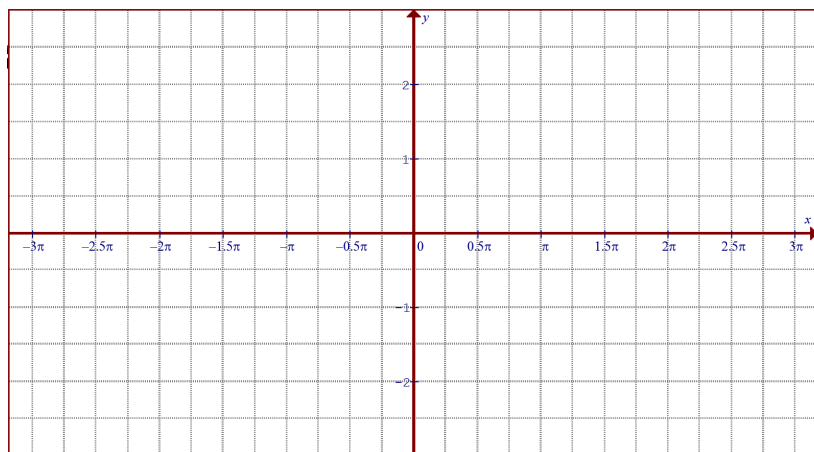
4. Graph the function on the graph provided: $y = -\frac{3}{2} \sin\left(\theta + \frac{3\pi}{2}\right) - 0.5$



Indicate the domain and range:

Find a general formula for all the x-intercepts

5. Graph the function on the graph provided: $y = 0.5 \cos(\pi - \theta) + 1$



Indicate the domain and range:

Find a general formula for all the x-intercepts

6. Each function in the form of $y = a \sin(\theta - c) + d$, match it with the corresponding graph on the right:

i) $0 < a < 1, d > 0$		b)
ii) $a = -3, c = 2, d = 1$	a)	e)
iii) $a > 4, c = -2$	c)	f)
iv) $a < -3, c = 3$	f)	g)

7. Find the equation of a function in the form of $y = a \cos(x - b) + d$ with the following:

a. Maximum at 8, minimum at -2, phase shift of $\frac{\pi}{2}$ units to the right

b. Maximum point $\left(\frac{\pi}{3}, 10\right)$ next minimum point $\left(\frac{4\pi}{3}, 4\right)$

8. Given the function $y = a \cos(\theta - b) + d$, what is the range of the function?

9. In order for the function $y = a \sin(\theta - c) + d$ to have an x-intercept, which of the following must be true?

- i) $a < d$ ii) $a + d = 1$ iii) $c < d$ iv) $d > a$ v) $a - d = 0$

10. Find the equation of a function in the form of $y = a \sin(x - b) + d$ with a maximum value of 3 when $x=0$ and a minimum of -2.

11. Find the amplitude and phase shift of the following function: $y = \sin^3 \theta + \sin \theta \cos^2 \theta$

12. Find the amplitude and phase shift of the following function: $y = 4 \sin 30^\circ \cos \theta - 4 \sin \theta \cos 30^\circ + 3$

13. (a) Determine all angles θ with $0^\circ \leq \theta \leq 180^\circ$ and $\sin^2 \theta + 2 \cos^2 \theta = \frac{7}{4}$.



(a) Without using a calculator, determine positive integers m and n for which

$$\sin^6 1^\circ + \sin^6 2^\circ + \sin^6 3^\circ + \cdots + \sin^6 87^\circ + \sin^6 88^\circ + \sin^6 89^\circ = \frac{m}{n}$$

(The sum on the left side of the equation consists of 89 terms of the form $\sin^6 x^\circ$, where x takes each positive integer value from 1 to 89.)

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